State of California
The Resources Agency
Department of Water Resources
Division of Environmental Services

Water Quality Conditions in the Sacramento-San Joaquin Delta During 1997-2000

Report to the State Water Resources Control Board in Accordance with Water Right Decision 1641.

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Foreword

The California State Water Project (SWP) and the federal Central Valley Project (CVP) are multipurpose projects which supply water, provide flood control, generate power, and provide recreation opportunities. Water quality needs and environmental impacts are important considerations for operators of both projects.

As a condition for operating the SWP and the CVP, the State Water Resources Control Board (SWRCB) has issued a series of water right decisions to the Department of Water Resources (DWR) and the US Bureau of Reclamation (USBR). These decisions establish water quality objectives and responsibilities for monitoring to protect the beneficial uses of water supplies in the Sacramento-San Joaquin Delta (Delta) and Suisun Marsh. Past decisions have included Water Right Decision 1379 (D-1379) of July 1971 and Water Right Decision 1485 (D-1485) of August 1978. Water Right Decision 1641 (D-1641) superceded D-1485 in December 1999.

Staff from DWR, USBR, US Geological Survey, and Department of Fish and Game monitored water quality from 1997 through 2000 to ensure and document compliance with the standards contained in D-1485 and D-1641. The monitoring program and its associated special studies also provided SWP and CVP operators with information to determine (1) changes in aquatic biota and water quality potentially related to SWP and CVP operations; (2) the effectiveness of project operation decisions in preserving the water quality of the Delta and Suisun Marsh; and (3) alternative operating criteria to better protect the waters of the Delta and Suisun Marsh.

In accordance with requirements of past water right decisions, DWR has prepared summary reports of monitoring results and submitted them to the SWRCB. This report is submitted to satisfy the reporting requirement for calendar years 1997 through 2000. Calendar years 1997 through 1999 are being reported pursuant to the mandate of D-1485, and calendar year 2000 is being reported pursuant to the mandate of D-1641. Finally, the compliance monitoring database is available electronically to serve as a source of additional information for agencies, organizations, and individuals involved in the study of the Bay-Delta system.

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Executive Summary

This report summarizes the results of water quality monitoring and special studies conducted by the Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) within the Sacramento-San Joaquin Delta and Suisun and San Pablo bays (the upper San Francisco Estuary) from 1997 to 2000. This monitoring is mandated by Water Right Decision 1641(D-1641) of December 1999, and its predecessor, Water Right Decision 1485 (D-1485) of August 1978. This report is submitted to fulfill the reporting requirements of these decisions.

Water years 1997 through 2000[1] represent a continuation of an extended period of relatively high precipitation that began in northern California in the fall of 1994. Water Years 1997, 1998, and 1999 were classified as "Wet", and Water Year 2000 was classified as "Above Normal" using the Sacramento Valley 40-30-30 Water Year Hydrological Classification Index. Precipitation, runoff, reservoir storage, and snow pack water content were all "above normal" for these four water years.

DWR and USBR monitored water quality using a protocol implemented in 1996. Under this protocol, eleven sampling sites representing eight regions of the upper San Francisco Estuary were monitored for selected physical and chemical water quality parameters. The results for water temperature, Secchi disk depth, dissolved oxygen (DO), specific conductance, dissolved inorganic nitrogen, orthophosphate, and volatile suspended solids were within their historical range, demonstrated seasonal and inter-annual variation, and provided no major discernable long-term trends.

Special studies of algal blooms within in the upper Estuary were conducted in response to the initial findings of mandated monitoring. These studies were needed to: (1) identify the organisms present in these blooms; (2) document the extent and intensity of the blooms; and (3) provide information to operators of the State Water Project (SWP) and the federal Central Valley Project (CVP). SWP and CVP operations may be modified when bloom algae are known to clog filters and produce water taste and odor problems for water users.

Sixteen algal blooms were detected and monitored during the study period, with the organisms identified as belonging to the following genera: *Microcystis, Cryptomonas, Skeletonema,* and *Aulacoseria*. Bloom activity occurred primarily in the spring and fall within the central and southern Delta.

DWR also conducted a series of special studies to monitor DO levels within the Stockton Ship Channel (Channel) during the late summer and early the fall of calendar years 1997 through 2000. The studies were conducted to determine if DO levels dropped below State Water Resources Control Board's (5.0 mg/L) and Regional Central Valley Water Quality Control Board's (6.0 mg/L) water quality objectives established for the Channel. Monitoring was typically conducted biweekly from August through November from Prisoner's Point in the central Delta to the Stockton Turning Basin at the eastern terminus of the Channel. DO levels within the western Channel typically exceeded 7.0 mg/L throughout the study period, while levels within the central Channel dropped to, and occasionally below, 5.0 mg/L. In the eastern Channel immediately west of Rough and Ready Island, DO levels consistently dropped below 5.0 mg/L. By November of each year DO levels throughout the Channel typically improved to 6.0 mg/L or greater due to improved San Joaquin River inflows, cooler water temperatures, and other factors.

To monitor productivity throughout the upper San Francisco Estuary, chlorophyll samples were collected to measure levels of chlorophyll *a* at 11 representative stations. Phytoplankton samples were also collected for identification and enumeration. Chlorophyll *a* concentrations for 1997-2000

[1] Although this report covers calendar years 1997 through 2000, hydrologic conditions within the upper San Francisco Estuary are characterized using water years. A water year begins on October 1 of one calendar year and ends on September 30 of the following calendar year. A water year is numbered using the calendar year in which it ends. For example, water year 1997 began on October 1, 1996, and ended on September 30, 1997.

were below 10 µg/L for most regions. Concentrations commonly ranged between 0.5 µg/L and 15 µg/L throughout the estuary. Diatoms comprised the spring chlorophyll *a* maximum and flagellates comprised the summer maximum in the north Delta, lower Sacramento River, lower San Joaquin River, central Delta, south Delta, and east Delta. In Suisun Bay most of the chlorophyll *a* was due to flagellates, the crytophyte *Cryptomonas ovatas*, and diatoms, *Skeletonema sp.* and *Aulacosira granulate*. In San Pablo Bay, flagellates and various diatoms were dominant.

Benthic monitoring was conducted at 10 representative stations throughout the upper San Francisco Estuary to document substrate composition and the distribution, diversity and abundance of benthic organisms. The benthic community was determined to be a diverse assemblage of worms, crustaceans, insects, and molluscs. The nine phyla represented include: Cnidaria (hydras, sea anemones), Platyhelminthes (flatworms), Nemertea (ribbon worms), Nematoda (roundworms), Annelida (segmented worms), Arthropoda (aquatic insects, amphipods, isopods, shrimp, crabs, mites, etc.), Mollusca (clams, snails), Chordata (tunicates), and Echinodermata (sea stars). Of the nine phyla identified, Annelida, Arthropoda, and Mollusca constituted 99.4% of the organisms collected.

Contents

Foreword ..... **iii**

Executive Summary ..... **v**

Chapter 1. Introduction **1-1**

Chapter 2. Hydrologic Conditions **2-1**

Chapter 3. Water Quality Monitoring **3-1**
Parameters Measured 3-3
Water Temperature 3-3
Secchi Disk Depth 3-3
Dissolved Oxygen 3-3
Specific Conductance 3-7
Dissolved Inorganic Nitrogen 3-7
Orthophosphate 3-10
Volatile Suspended Solids 3-10

Chapter 4. Chlorophyll and Phytoplankton Community Composition, 1997-2000 ..... **4-1**

Chapter 5. Zooplankton, 1997-2000 ..... **5-1**
Methods 5-1
Results 5-3
Mysids 5-3
Calanoid Copepods 5-5
Cyclopoid Copepods 5-7
Cladocera 5-7
Rotifers 5-10

Chapter 6. Benthic Community Density and Composition **6-1**
Methods 6-1
Results 6-5

Chapter 7. Special Studies **7-1**
Dissolved Oxygen Monitoring in the Stockton Ship Channel 7-1
Methods 7-1

Results and Discussion 7-2
Calendar Year 1997 7-3
Calendar Year 1998 7-5
Calendar Year 1999 7-5
Calendar Year 2000 7-8
Turning Basin 7-8
Summary 7-8
Algal Bloom Surveys 7-10
Introduction 7-10
Methods 7-11
Results 7-12
Summary 7-13

Chapter 8. Continuous Monitoring, 1997-2000 8-1
San Joaquin River Dissolved Oxygen Compliance 8-3

Appendix A. References A-1

Figures

Figure 1-1 Map of all Bay-Delta Section monitoring sites 1-2

Figure 2-1 Sacramento River Hydrologic Region 40-30-30 and the San Joaquin River Hydrologic Region 60-20-20 Indices from 1990 through 2000. 2-2
Figure 2-2 Unimpaired runoff for the Sacramento and San Joaquin Rivers for water years 1990 through 2000. 2-3
Figure 2-3 Net Delta Outflow Indices 1997 through 2000. 2-3

Figure 3-1 Map of sampling sites 3-1
Figure 3-2 Monthly water temperatures (°C) at eight upper San Francisco Estuary regions, 1997-2000 3-4
Figure 3-3 Monthly Secchi disk depths (cm) at eight upper San Francisco Estuary regions, 1997-2000 3-5
Figure 3-4 Monthly DO levels (mg/L) at eight upper San Francisco Estuary regions, 1997-2000 .. 3-6
Figure 3-5 Monthly specific conductance measurements (µS/cm) at eight upper San Francisco Estuary regions, 1997-2000 3-8
Figure 3-6 Monthly dissolved inorganic nitrogen levels (mg/L) at eight upper San Francisco Estuary regions, 1997-2000 3-9
Figure 3-7 Monthly orthophosphate levels (mg/L) at eight upper San Francisco Estuary regions, 1997-2000 3-11
Figure 3-8 Monthly volatile suspended solids levels (mg/L) at eight upper San Francisco Estuary regions, 1997-2000 3-12

Figure 4-1 Map of chlorophyll and phytoplankton monitoring stations 4-2

Figure 4-2 Chlorophyll *a* and pheophytin in the north Delta and lower Sacramento River, 1997-2000 4-3
Figure 4-3 Chlorophyll *a* and pheophytin in the lower San Joaquin River and central Delta, 1997-2000 4-4
Figure 4-4 Chlorophyll *a* and pheophytin in the east Delta and south Delta, 1997-2000 4-5
Figure 4-5 Chlorophyll *a* and pheophytin in Suisun and San Pablo bays, 1997-2000 4-6

Figure 5-1 Zooplankton monitoring stations 5-2
Figure 5-2 Monthly mysid abundance upstream from, in, and downstream from the entrapment zone, 1997-2000 5-4
Figure 5-3 Monthly calanoid abundance upstream from, in, and downstream from the entrapment zone, 1997-2000 5-6
Figure 5-4 Monthly cyclopoids abundance upstream from, in, and downstream from the entrapment zone, 1997-2000 5-8
Figure 5-5 Monthly cladocera abundance upstream from, in, and downstream from the entrapment zone, 1997-2000 5-9
Figure 5-6 Monthly rotifer abundance upstream from, in, and downstream from the entrapment zone, 1997-2000 5-11

Figure 6-1 Map of benthic monitoring stations 6-2
Figure 6-2 Total estuary contribution by phyla from 1997 through 2000 6-5
Figure 6-3 Percent abundance of macrobenthos at Stations C9 and P8, 1997-2000 6-6
Figure 6-4 Percent abundance of macrobenthos at Stations D28A and D16, 1997-2000 6-7
Figure 6-5 Percent abundance of macrobenthos at Stations D24 and D4, 1997-2000 6-8
Figure 6-6 Percent abundance of macrobenthos at Stations D6 and D7, 1997-2000 6-9
Figure 6-7 Percent abundance of macrobenthos at Stations D41 and D41A, 1997-2000 6-10
Figure 6-8 Sediment composition at sampling Stations C9 and P8, 1997-2000 6-11
Figure 6-9 Sediment composition at sampling Stations D28A and D16, 1997-2000 6-12
Figure 6-10 Sediment composition at sampling Stations D24 and D4, 1997-2000 6-13
Figure 6-11 Sediment composition at sampling Stations D6 and D7, 1997-2000 6-14
Figure 6-12 Sediment composition at sampling Stations D41 and D41A, 1997-2000 6-15

Figure 7-1 Map of dissolved oxygen monitoring stations 7-2
Figure 7-2 Dissolved oxygen concentrations in the Stockton Ship Channel in 1997 7-4
Figure 7-3 Dissolved oxygen concentrations in the Stockton Ship Channel in 1998 7-6
Figure 7-4 Dissolved oxygen concentrations in the Stockton Ship Channel in 1999 7-7
Figure 7-5 Dissolved oxygen concentrations in the Stockton Ship Channel in 2000 7-9
Figure 7-6 Map of algal blooms surveyed during 1997-2000 7-11

Figure 8-1 Map of continuous water quality monitoring stations 8-1
Figure 8-2 Range of monthly DO values on the San Joaquin River at Rough and Ready Island, 1997-2000 8-4
Figure 8-3 Monthly averages of water quality parameters measured at Martinez for calendar years 1997-2000 8-5
Figure 8-4 Monthly averages of water quality parameters measured at Mallard for calendar years 1997-2000 8-6

Figure 8-5 Monthly averages of water quality parameters measured at Antioch for calendar years 1997-2000 8-7
Figure 8-6 Monthly averages of water quality parameters measured at Rio Vista for calendar years 1997-2000 8-8
Figure 8-7 Monthly averages of water quality parameters measured at Hood for calendar years 1997-2000 8-9
Figure 8-8 Monthly averages of water quality parameters measured at Stockton for calendar years 1997-2000 8-10
Figure 8-9 Monthly averages of water quality parameters measured at Mossdale for calendar years 1997-2000 8-11

Tables

Table 2-1 Summary of the major hydrologic characteristics of water years 1997 through 2000 2-2
Table 2-2 Average runoff for water years 1997, 1998, 1999, and 2000. 2-2

Table 3-1 Water quality parameters measured 3-2
Table 3-2 Sampling sites and regions 3-2
Table 3-3 Nutrient analysis methods 3-7

Table 6-1 Macrobenthic monitoring station characteristics 6-3
Table 6-2 New species, 1997-2000 6-4

Table 7-1 Summary of flow and water quality conditions in the San Joaquin River during the late summer and fall, 1997-2000 7-3

Table 8-1 Station characteristics for the Continuous Monitoring Program 8-2

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